Unit 1 Review

ANSWERS TO QUESTIONS

Understanding Concepts

1. (a) chemical
   (b) alloy
   (c) precipitate
   (d) element
   (e) Metals
   (f) atomic number
   (g) ion
   (h) nucleus
   (i) radius
   (j) Synthetic
   (k) periodic
2. (a) False. Combustion is the chemical reaction between a fuel and oxygen.
   (b) True.
   (c) False. Viscosity describes the resistance to flow of a substance.
   (d) True.
   (e) False. The chemical symbol for calcium is Ca.
   (f) False. The modern periodic table arranges elements by atomic number.
   (g) True.
   (h) False. A neutron is neutral and is located in the nucleus.
3. (a) A physical property is any characteristic of a substance that does not depend on the effect of other substances. A chemical property describes how a substance will interact with another substance.
   (b) Wood is brown and burns. Gasoline is a liquid and burns. Baking soda is white and reacts with acid.
4. (a) hardness
   (b) combustibility (flammability)
   (c) chemical change
   (d) physical change
   (e) soluble
   (f) synthetic
5. (a) A chemical change produces a new substance.
   OR
   A physical change does not produce a new substance.
   (b) The formation of frost is a physical change.
   (c) A new colour may indicate a physical or a chemical change.
   (d) The ability to react with an acid is an example of a chemical property.
   (e) No substances are safe to taste in the lab.
   (f) A physical change is a change of state or form.
   (g) Corrosion is a reaction of metal with oxygen in the air.
   (h) Goggles may be taken off if all students have finished their experiments and cleaned up.
   (i) Compounds are made up of elements.
   (j) Metals are shiny and good conductors.
   (k) Electrons are negative particles in orbits around the nucleus.
   OR
   Protons are positive particles found in the nucleus.
   (l) The mass number is the sum of the protons and neutrons in an atom.
   (m) A Bohr diagram shows electrons in orbit.
   (n) Mendeleev's table organized elements by atomic mass.
   (o) Elements in the same family or group have similar properties.
6. Five clues that indicate a chemical change include a colour change, formation of gas, formation of a precipitate, an energy change, or difficulty of reversing change.
7. (a) physical (change of state)
   (b) physical (soap dissolving grease)
   (c) physical (filament is heating up)
   (d) chemical (dough changes into cake)
   (e) chemical (burning)
   (f) chemical (decay/decomposition)
   (g) physical (change of shape)
   (h) chemical (explosion)
8. Two compounds are water (H_2O) and hydrogen peroxide (H_2O_2) or carbon dioxide (CO_2) and carbon monoxide (CO).
9. Copper phosphate contains three copper, one phosphorous, and four oxygen atoms. Sodium nitrate contains one sodium, one nitrogen, and three oxygen atoms.
10. (a) Both describe a substance, but a physical property is a characteristic or description of a substance that may help to identify the substance, whereas a chemical property describes the behaviour of a substance as it becomes a new substance.
    (b) Both are reactions with oxygen, but combustion is very fast whereas corrosion is very slow.
    (c) Both are pure substances, but an element contains only one kind of atom whereas a compound contains two or more kinds of atoms.
    (d) Both are particles, but an atom is indivisible in a chemical change whereas a molecule can be divided.

(e) Both are elements, but a metal is shiny, malleable, and conducts electricity. A nonmetal is dull, brittle, and does not conduct electricity.
(f) Both are involved in metallurgy, but a mineral is a pure substance, whereas ore is an impure substance.
(g) Both are materials, but natural materials can be found in nature, whereas synthetic materials are developed in the laboratory.

11.(a) Protons are found in the nucleus.
(b) Neutrons are found in the nucleus.
(c) Electrons are found in orbits around the nucleus.
(d) Protons and neutrons make up most of the mass.
(e) Electrons take up most of the space.

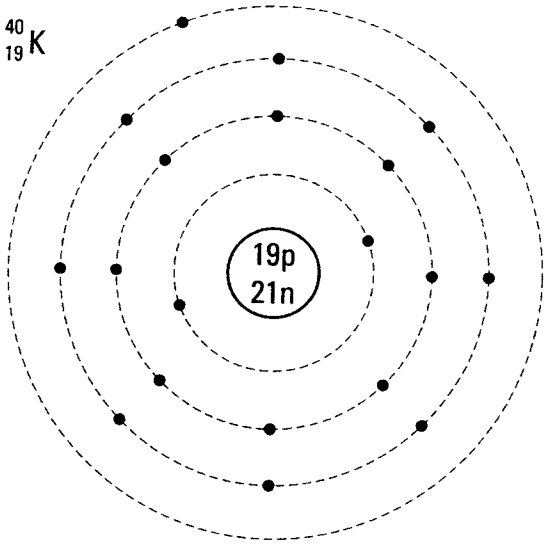
12. If elements are arranged according to their atomic mass, a pattern can be seen in which periodic properties occur regularly.
13. The modern periodic law arranges the elements according to their atomic number rather than their atomic mass.
14.(a) Metals are found on the left and to the centre.
(b) Nonmetals are found on the right-hand side of the step-wise line.

Applying Skills

15. Answers may include safety goggles, tongs, gloves, lab aprons, etc.
16. This is a physical change. Solid sulphur has melted to form a liquid. (Note: A colour change by itself does not indicate a chemical change.)
17. The change is a physical change. The solid and liquid in these state changes have the same melting and freezing points.
18.(a) This could represent the formation of water from hydrogen and oxygen molecules.
(b) hydrogen + oxygen → water.
19. See **Table 1** below.

20.(a) Potassium chloride is KCl.
(b) Calcium oxide is CaO.
(c) Aluminum sulphide is Al_2S_3.

21.(a)



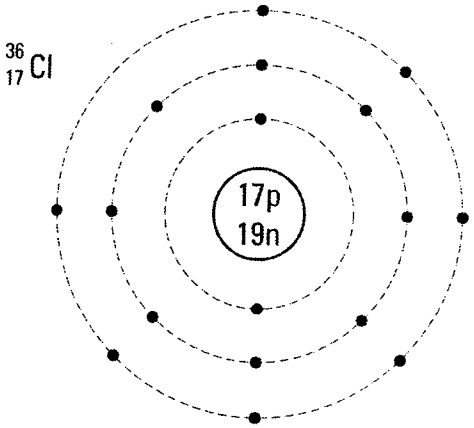
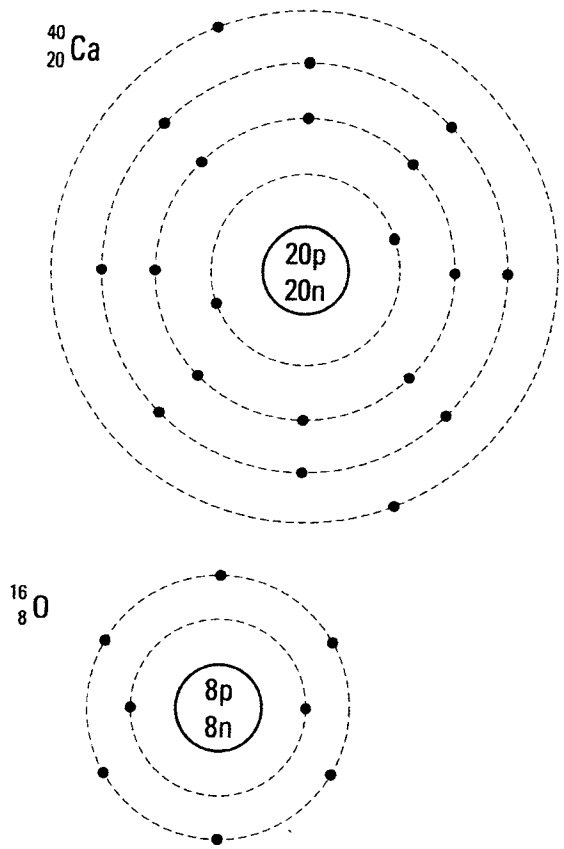


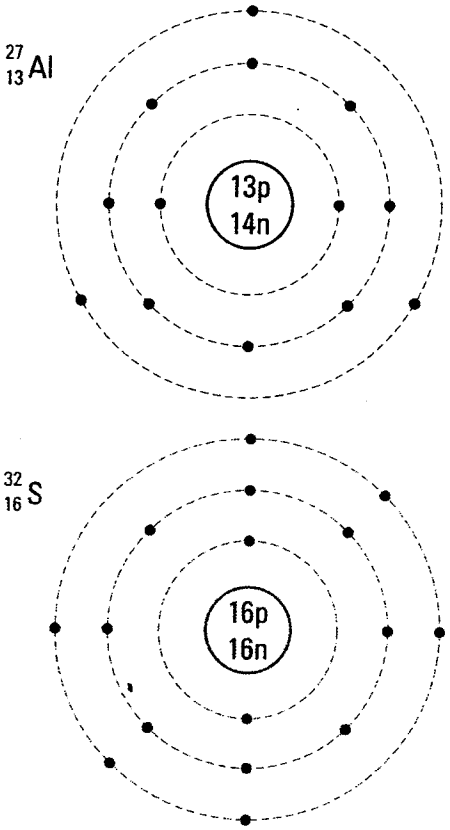
Table 1 For question 19

Element	Symbol	Atomic Number	Mass Number	Number of Protons	Number of Electrons	Number of Neutrons
beryllium	Be	4	9	4	4	5
carbon	C	6	12	6	6	6
silicon	S	14	28	14	14	14
potassium	K	19	39	19	19	20

(b)



(c)



22.(a) 19 protons and 21 neutrons
(b) 13 protons and 15 neutrons
(c) 6 protons and 8 neutrons

23.

Description		Term	
A	smallest particle of an element	10	atom
B	substance containing only one type of atom	1	element
C	connection between atoms	11	bond
D	particle made up of two or more atoms	5	molecule
E	number of protons	7	atomic number
F	positive subatomic particle	3	proton
G	sum of protons and neutrons	8	mass number
H	uncharged subatomic particle	9	neutron
I	very long molecule	6	polymer
J	material formed by mixing two or more materials	4	composite
K	produced by people	2	synthetic

24. Metals (gold, titanium alloy), polymers (leather, nylon), composites (mud-straw, fibreglass), and ceramics (stone, superconducting ceramics).

25.(a) Concrete with steel bars is a composite chosen for strength.
(b) Pottery is a ceramic chosen for heat insulation.
(c) Bronze is a metal chosen for strength.
(d) Polyethylene is a polymer chosen for flexibility.
(e) Cotton-nylon is a composite chosen for breathability and wrinkle-resistance.

26. Compounds may be different colours from the elements of which they are made.

Making Connections

27.(a) Aerosols may be flammable and explosive.
(b) Drain cleaner may be poisonous and corrosive.
(c) Ant powder may be poisonous.
(d) Furniture polish may be flammable and poisonous.

28. Answers could be conceptually connected to the arrangement of the elements in the periodic table.

29.(a) germanium = Germany
lutetia = ancient name for Paris
polonium = Poland
(b) mercury = Mercury
uranium = Uranus
neptunium = Neptune
plutonium = Pluto
tellurium = Tellus (Latin for Earth)
selenium = Selene (Greek for Moon)
palladium = Pallas (an asteroid)
cerium = Ceres (an asteroid)

(c) gadolinium = Gadolin (a Finnish chemist)
curium = Marie Currie
einsteinium = Albert Einstein
fermium = Enrico Fermi
mendelevium = Dmitri Mendeleev
lawrencium = Ernest Lawrence
nobelium = Alfred Nobel
seaborgium = Glenn Seaborg

(d) europium = Europe
hafnium = Hafnia (Latin for Copenhagen)
americium = America
berkelium = Berkely
californium = California

30.(a) The change is physical (sublimation).

(b) The carbon dioxide prevents combustion by smothering the flame and removing oxygen.

31. Plastic and fibreglass tend to become more brittle and crack in sunlight over periods of time. Plastics are replacing metals in everything from automobile body panels to cooking utensils for microwave ovens.

32. The atomic model has undergone many changes since Aristotle's model.

33.(a) Electrons in the outer shell are involved in chemical reactions, because they collide with other atoms, and because they are able to move from one atom to another.

(b) Mercury and lead are both elements that are hazardous because of their reactivity (involving electrons) in biological systems. Uranium is an element that is dangerous because its nucleus is unstable and hence radioactive.

34. The compounds are sodium bicarbonate (sodium hydrogen carbonate) or baking soda, sodium nitrate (a preservative used in meat to preserve colour and inhibit botulism to a degree), and calcium phosphate (an ingredient in garden supplies like plant food and fertilizers). The formulas are adequate for identifying the substances and to allow customs to clear the chemicals for entry into the country.

35. The posters should contain accurate information and be visually attractive for display. You may wish to specify minimum sizes for the Bohr model, atomic number, and symbol.

36. The pairs are argon and krypton, cobalt and nickel, and tellurium and iodine. Students should give reasonable explanations that show some understanding of periodicity and periodic trends acceptable at this level